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The Flower-Adapted Tongue of a Timaliinae Bird  
and Its Implications

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*Myzornis* is a monotypic genus for a small, little known, passerine bird of higher altitudes in the Himalayas. The genus is traditionally placed in the Timaliidae and has been associated with *Chloropsis* and *Aegithina* by Stuart Baker (1922, p. 345), perhaps because of its predominately green coloration, and with *Leiothrix* and *Cutia* by Delacour (1946, p. 29), presumably because of the red, black and white pattern in the wing. In the latest treatment of the family (as a subfamily) by Deignan (1964, x, p. 428), *Myzornis* is placed in a group, "Genera sedis incertae," along with a small miscellany of other non-conformists, at the end of the Timaliinae. In the rather slender, but only slightly elongated bill, *Myzornis* is only somewhat different from certain other Timaliinae genera such as *Yuhina*.

In addition to the above, the most outstanding features of *Myzornis* seem to be the black and green, scale-like pattern of the head and the nectar-adapted tongue. Though the brush-tipped character of the tongue was mentioned as early as 1890 (Murray, p. 173), there seems to be no detailed description of the tongue, and it seemed worthy of examination for possible clues to relationships. Thanks to the efforts of Dr. Robert L. Fleming, Superintendent of the United Christian Medical Mission to Nepal and an Associate of the Field Museum of Natural History, the Museum has a series of these birds with their dried tongues, and Dr. Fleming's notes on the species, habits.

The tongue of *Myzornis* proves to be not only brush-tipped, but curled-tubular, frayed and split (fig. 2). The tongue is horny and as long as the bill. In the dried tongue the basal portion is flat and anteriorly the edges soon curl in to form a tube. In the middle third

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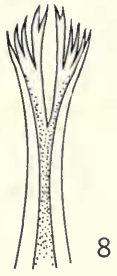
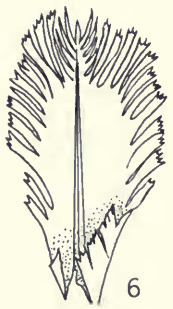
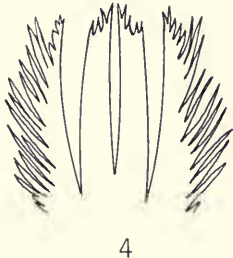
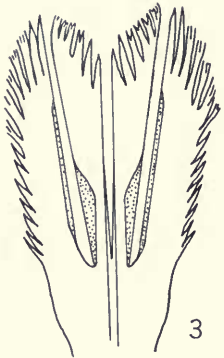
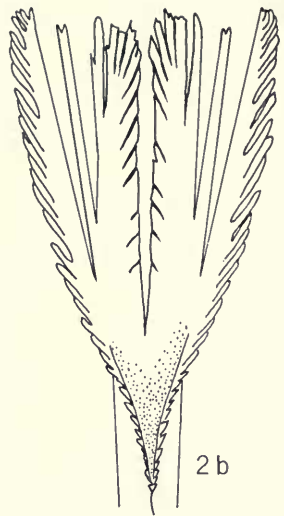
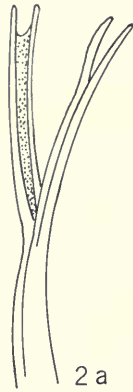
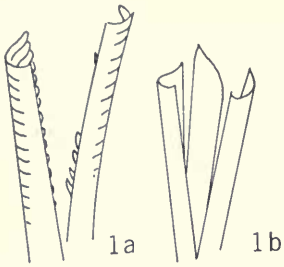
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of the tongue this curling seems to continue until two parallel tubes are formed. In the terminal third the tongue is split along the midline and has the tips frayed and curled to give two more or less tubular branches with brush tips.

When the tongue is softened in water and flattened, the structure of the tip appears as follows (fig. 2): each half of the tip has a feather-like structure with a rachis-like, horny "shaft" and vane-like margins frayed on each edge but more so on the outer web. In addition, the terminal end of the rachis-like shaft is frayed or split into a dense tuft of straight bristles. These apparently remain straight and in the dried tongue are more or less enclosed by the curled bristles of the margins. This appears to be a tongue highly specialized for flower feeding—tubular for nectar, fringed for picking up small insects and nectar, and with a tuft of straight bristles at the tip for probing. This type of tongue is not reported elsewhere in the Timaliidae.

The little we know of *Myzornis*' feeding and behavior is from a series of short notes recorded over the years. *Myzornis* is said to have been found on the ground, on tree trunks climbing like a creeper, in bushes, in the lower limbs of trees, and in treetops. It is recorded as solitary, occurring in pairs, and in mixed parties of other small birds. It is said to sit quietly, to hop about actively, to make short sallies like a flycatcher, to hover in front of flowers and probe into them, and to alight on tree trunks and drink sap oozing from a hole in the bark. Stomach contents are reported as small insects and berries (see especially Jerdon, 1863, p. 263; Stevens, 1924, p. 739; and Salim Ali, 1962, p. 189).

Such a composite picture is not unusual in compiling data on birds from lesser known parts of the world, but it is discouraging when attempting to outline the normal and characteristic aspects of a species behavior. Can the bird be so versatile, especially in view of its nectar-adapted tongue? However, the recorded observations

FIG. 1. Diagrammatic views of distal portions of tongues, flattened, of eight songbird families, to show differences in detail of flower-feeding adaptation.

1. Nectariniidae: (a) *Nectarinia jugularis*; (b) *Aethopyga*.
2. Dicaeidae: (a) *Dicaeum trigonostigma*; (b) *D. nigrilore*.
3. Meliphagidae: (*Apalopteron*).
4. *Promerops cafer*.
5. Coerebidae: *Cyanerpes cyanea*.
6. Drepaniidae: *Vestiaria coccinea*.
7. Chloropsidae: *Chloropsis*.
8. Zosteropidae: *Zosterops simplex*.

References for drawings: 1, Scharnke. 2a, Gadow. 2b, Rand. 3, Deignan, 1958. 4, Scharnke. 5, Lucas. 6, Scharnke. 7, specimen. 8, Beddard.

do corroborate the evidence of the tongue that *Myzornis* is a flower feeder at least part of the time. That flower-feeding is characteristic of the species is indicated by the Nepal name that translates "mountain honeysucker" (Jerdon, 1863).

Dr. Fleming writes that he found *Myzornis* common on the east Nepal border between 7,000 and 8,000 feet altitude where it was usually in the branches of large oaks, or in bamboo clumps in forest glades. When the bird was sitting quietly on a perch it reminded him of a *Chloropsis*, but when it was excited it behaved like a sunbird, hopping about, turning its head from side to side, and calling "... chi - chi ..." all in the same pitch. Once the voice was learned it was easy to locate the birds by ear.

Before I had examined the tongue of *Myzornis* I had considered the possibility of this bird being an aberrant member of one of the flower-feeding groups of birds occurring in southern Asia, the specialized sunbirds (Nectariniidae), or the less specialized flowerpeckers (Dicaeidae), white-eyes (Zosteropidae), leaf birds, i.e., *Chloropsis* (Chloropseidae), or even an extralimital member of the specialized honeyeaters (Meliphagidae) of the Australian area. Until these possibilities had been explored, I was inclined to consider *Myzornis* as a bird of status "sedis incertus," as Deignan did. But the tongue, while as specialized a flower-feeding organ as that of any of the above groups, differs in detail of structure which does not suggest relationship with any of them. (Comparisons follow.)

As an indicator of relationship, the flower-feeding tongue of *Myzornis* has proved of little value. The role of the tongue in taxonomy has been discussed a number of times, for instance, by Gardner (1925) for birds in general, by Amadon (1950, pp. 221-224) for the Hawaiian honeycreepers and possible relatives, and Rand (1961) for flowerpecker-honeyeater possible relatives. Sometimes it is useful in confirming relationship indicated by other characters (Deignan, 1958); sometimes it suggests relationship, as between the Dicaeidae and Nectariniidae and Meliphagidae (Rand, 1961); and sometimes it is not useful, as in the present instance.

Otherwise the only outstanding indicator of relationship of *Myzornis* is the greenish color and the variegated pattern of the wing and tail. This seems to suggest relationships with that part of the Timaliidae represented by *Leiothrix-Minla* where Delacour (1946) placed it. The diversification of general habits shown by these birds as outlined by Salim Ali (1962) also accords with the recorded habits of *Myzornis*, though only the related, duller-colored genera *Yuhina* and *Heterophasia* are recorded as regular flower feeders.

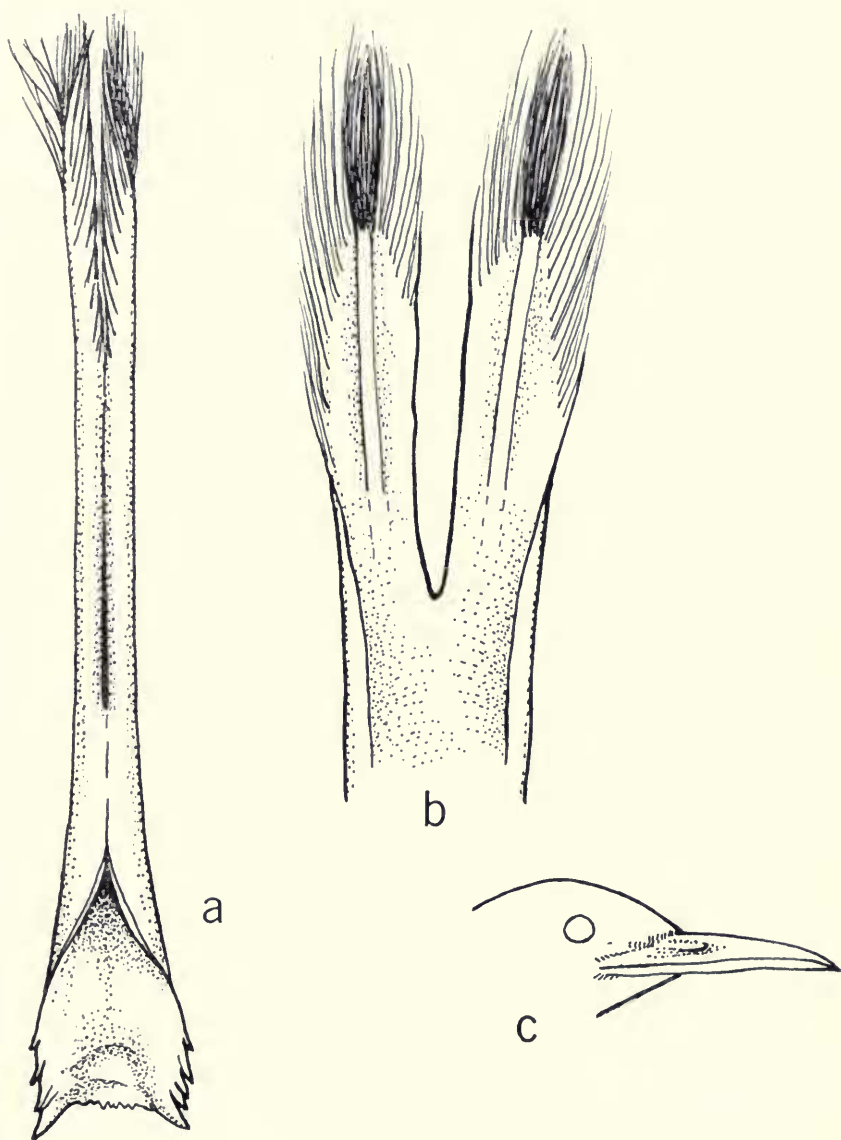


FIG. 2. *Myzornis pyrrhoura*. (a) Whole tongue seen from above; length about 16 mm.; (b) Enlargement of tip, of tongue, flattened; (c) Head of bird.



Southern Asia is not the headquarters of any specialized group of flower feeders and the most specialized group of flower feeders occurring there, the sunbirds, is the result of an invasion from Africa at an earlier period. However, southern Asia is the headquarters of the species-rich and genus-rich Timiliidae which has evolved many types from jay-like to warbler and tit-like birds of various sizes, colors and patterns and bill shapes, and some of these birds have a rather wide spectrum of feeding habits, on insects, fruits and at flowers. Presumably *Myzornis* is an offshoot of the *Leiothrix-Minla-Yuhina* branch of the family, specialized in structure for flower feeding but still retaining the family diversity of feeding habits. On present evidence I would place it, as Delacour did, among the small, brightly colored and marked members of the family, near *Leiothrix*.

A certain amount of curling, splitting and fraying occurs in members of many songbird families (see Gardner, 1925). In only eight songbird families is curling, fraying, and/or splitting carried to an extreme elaboration for flower feeding. Even in these eight families not all members of each family have such pronounced modifications. While the curling in of the edges of the central part of the tongue to form a tube is common to all, extreme modification for flower feeding, the detail of the tip, in curling, in fraying along the side, and/or splitting down from the tip to give longitudinal division, varies from group to group as outlined below.

A. In the Old World there are two large songbird families most of which are flower feeders.

1. Meliphagidae. In the honeyeaters the predominate pattern is to have the tip split into four parts, each of which is frayed along one margin. However, one species with a much simpler tongue is known, *Melipotés*, of New Guinea (Scharnke, 1933, p. 355), though it still shows a rudimentary four-parted tip. Probably this is degenerate, following a switch to a predominately berry diet.

The sugar bird, *Promerops*, of South Africa, now is usually placed in the Meliphagidae, chiefly because of the four-part tip of the tubular tongue. However, both Scharnke (1932, pp. 119 and 135) and Dorst (1952, p. 192) consider it more likely to be a case of convergence. There is one feature in the *Promerops* tongue that is rather different from any Meliphagidae I have examined or seen figured. Only the two outer parts of the tip are frayed to give the brush tip. The two centered elements are not frayed and appear as if modified for probing. A perplexing problem is that if it is not

a member of the Meliphagidae other relationships are as difficult to establish.

2. Nectariniidae. The usual sunbird tongue in the large genus, *Nectarinia*, has the tip split into two parts each of which is curled to form a tube. There is no obvious brush tip, though some slight fraying is evident under moderate magnification along the inner (not the outer) edges of each segment as Scharnke (1932, p. 117) shows it. However, Gadow (plate XVI, figs. 8-10) shows this fimbriation more accentuated. *Aethopyga* has a third flat element at the tip that helps complete the tubes (Scharnke, 1932, p. 117).

One species, however, *Anthreptes singalensis*, has the tongue flat with its edges slightly frayed, and with very little splitting at the tip, thus quite unlike the usual condition (Gardner, 1925, fig. 139).

B. In three other Old World families most species are better known as berry eaters and their most developed nectar-feeding adaptations are known in only a few species.

3. Dicaeidae. The flowerpeckers, in a few specialized species, have the tongue tip either (a) split into two parts each of which curls to form a tube, without fraying, or (b) splits into four parts each of which is frayed on one margin and curled.

Thus one condition recalls that of the sunbirds, the other approaches that of the honeyeaters. This may indicate an actual relationship. Some other flowerpeckers (*Melanocharis*), feeding on berries, have a standard, flat, passerine bird tongue.

4. Zosteropidae. In white-eyes with specialized tongues there is a median splitting at the tip, accompanied by lesser splitting and/or fraying to give a brush tip. This seems a less specialized condition than any of the above.

5. Chloropseidae. In the leaf bird, *Chloropsis*, the tip is more or less entire with a fimbriate fringe along the sides and around the tip, the whole curling to form a single tube.

6. Timaliidae. Among the babblers only one species, *Myzornis*, is known to have a flower-feeding tongue as described above. The tip is split in two with each half frayed on each side, and a central "shaft" which splits up to form a brush tip enclosed by the curling of the lateral fraying into a tube.

C. In the New World there are two songbird families with pronounced flower-adapted tongues in some species.

7. Coerebidae. The American honeycreepers have for their usual advanced pattern the tip of the tongue deeply cleft or split and

each half frayed on the outer side only. Curling apparently is pronounced.

8. Drepaniidae. The Hawaiian honeycreepers apparently have two advanced conditions: (a) the tongue is simply curled into a single tube, with little or no fraying or splitting, or (b) with little or no splitting, the edges are frayed and curl to form a single tube.

Among the songbirds, nectar adaptation has obviously arisen separately in each of the eight outstanding cases, discussed above, that have come to my attention. Other families, notably Parulidae and the Icteridae, have members with a tendency toward a nectar-adapted tongue. Such convergence is not surprising, and is also seen in bill shape in other groups: the broad flat bill for flycatching; slender bill for gleaning small insects; a hook at the tip of the bill for holding larger prey; and a heavy conical bill for seed eating.

More interesting is the fact that, beyond the simple gross adaptation of a tubular tongue for flower feeding, the finer details differ in detail of structure of the tip of the tongue for each specialized song-bird family. A similar function is achieved by a similar but not identical structural change.

#### REFERENCES

- ALI, SALIM  
1962. *The Birds of Sikkim*, pp. 1-414. Oxford University Press.
- AMADON, D.  
1950. The Hawaiian honeycreepers (Aves, Drepaniidae). *Bull. Amer. Mus. Nat. Hist.*, **95**, pp. 157-262.
- BAKER, E. C. STUART  
1922. *Fauna Brit. India. Birds*, **1**, pp. 1-479. London.
- BEDDARD, F. E.  
1891. Ornithological notes. *Ibis*, **1891**, pp. 510-512.
- DEIGNAN, H. G.  
1958. The systematic position of the bird genus *Apalopteron*. *Proc. U. S. Nat. Mus.*, **108**, pp. 133-136.  
1964. *Peters Check-list of Birds of the World*, **10**, p. 428. Cambridge, Mass.
- DELACOUR, J.  
1946. Les Timaliines. *L'Oiseau et R. F. O.*, **16**, pp. 1-36.
- DORST, J.  
1952. Contribution a l'étude de la langue des Meliphagides. *L'Oiseau et R. F. O.*, **22**, pp. 185-214.
- GADOW, H. H.  
1890-1900. *In Aves Hawaiiensis*, by S. B. Wilson and A. H. Evans, pp. 219-249, pl. III, fig. 56. London.



GARDNER, L. L.

1925. The adaptive modifications and the taxonomic value of the tongue in birds. *Proc. U. S. Nat. Mus.*, **67**, art. 19, pp. 1-49.

JERDON, T. C.

1863. *The Birds of India*, **2**, pp. 1-439. Calcutta.

LUCAS, F. A.

1895. Notes on the anatomy and affinities of the Coerebidae. . . . *Proc. U. S. Nat. Mus.*, **17**, pp. 299-312.

MAYR, E., and D. AMADON

1947. A review of the Dicaeidae. *Amer. Mus. Nov.*, no. 1360, pp. 1-32.

MURRAY, J. A.

1890. *The avifauna of British India*, **2**, pp. 1-838. London.

RAND, A. L.

1961. The tongue and nest of certain flowerpeckers (Aves: Dicaeidae). *Fieldiana: Zool.*, **39**, pp. 581-587.

SCHARNKE, H.

1932. Über den Bau der Zunge der Nectariniidae, Promeropidae, und Drepanididae. . . . *Jour. f. Orn.*, **80**, pp. 114-123.

1933. Über eine ruckgebildete Honigfresser-Zunge. *Jour. f. Orn.*, **81**, pp. 355-359.

STEVENS, H.

1924. Notes on the birds of the Sikkim Himalayas. *Jour. Bombay Nat. Hist. Soc.*, **29** (pts. 3-4), p. 739.